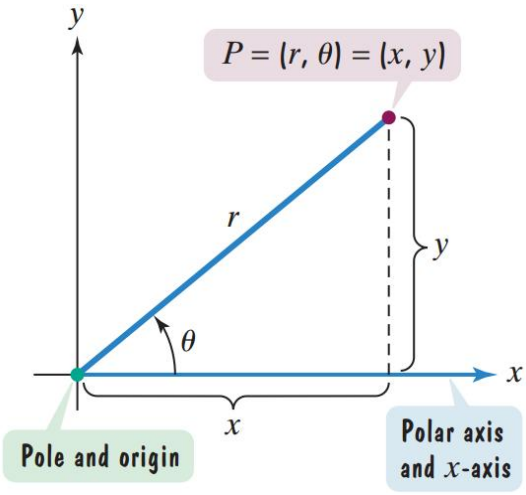
Chapter 6: Additional Trig Topic
Topic 3: Polar Coordinates
CONVERSIONS



Converting from Polar Coordinates (r, θ) to Rectangular Coordinates (x, y)

Using the given values of r and θ, the following relationships are helpful in finding an equivalent (x, y) coordinate:

$$x = r\cos\theta \qquad y = r\sin\theta$$

Gut check! Picture/graph the polar coordinate and the rectangular coordinate. Does it make sense that these are equivalent?

Examples: Find the rectangular coordinates of the points with the following polar coordinates.

1. $\left(2, \frac{3\pi}{2}\right)$
2. $(-8, 60°)$
3. $(-10, 30°)$
4. $(3, \pi)$

Converting from Rectangular Coordinates (x, y) to Polar Coordinates (r, θ)

Using the given values of x and y, the following relationships are helpful in finding an equivalent (r, θ) coordinate:

$$x^2 + y^2 = r^2 \qquad \tan\theta = \frac{y}{x}$$

Examples: Find the polar coordinates of the points with the following rectangular coordinates.

5. $(-1, \sqrt{3})$

Quadrant: *Find r:* *Find θ:* *Answer:*

6. $(1, -\sqrt{3})$

7. $(0, -4)$

8. $(-2, 0)$

Converting Equations from Rectangular Form to Polar Form

To convert a rectangular equation in x and y to a polar equation in r and θ:

- Replace x with $r\cos\theta$
- Replace y with $r\sin\theta$.
- Re-solve for r

Examples: Convert each equation to a polar equation.

9. $x + y = 5$

10. $3x - y = 6$

Converting Equations from Polar Form to Rectangular Form

Using the facts from above, we usually need to modify polar equations before we are able to convert them to rectangular equations

Summary of Polar/Rectangular relationships

Examples: Convert each equation to a polar equation.

11. $r = 3$

12. $\theta = 45°$

13. $r = \csc\theta$

14. $\theta = \frac{3\pi}{4}$

15. $r = \sec\theta$

16. $r = 4$